REMARKS

Applicants hereby confirm the election to continue prosecution of Group I, Claims 1 - 33, which was made during a telephone conversation between Examiner Thomas Parson and the undersigned attorney of record on October 7, 2002.

However, the Examiner's reason for the restriction requirement is in need of correction. Applicants agree that the claims in Class I (Claims 1 - 33) are drawn to an electrochemically roughened aluminum or aluminum alloy surface. Applicants agree that the claims in Class II (Claims 34 - 45) are drawn to a method of electrochemically roughening an aluminum or aluminum alloy surface. <u>Applicants do not agree that the product made by the electrochemical roughening process can be made by a bead blasting process</u>. In fact, applicants teach that the surface created by bead blasting is one which provides a sharp, jagged surface, of the kind shown in Figure 2, which exhibits rough tips which can curl over, forming hook-shaped projections 202 which can break off or entrap particles 204 including the bead blast particle itself. "As a result, the bead blasting media may act as a source of contamination of the aluminum surface." "Further, the sharp surface provided by bead blasting may complicate a subsequent anodization process"(Specification, paragraph 0009.) Whether there is some other surface roughening technique which can be used to produce the roughened surface claimed by applicants, which has the appearance of rolling hills and valleys when magnified (shown in Figure 3), is not known.

Applicants' attorney agreed to the restriction requirement on grounds that the method for electrochemically roughening a surface comprising aluminum or an aluminum alloy, as claimed in independent Claim 34, may have application in the surface preparation of other materials which are different from aluminum or an aluminum alloy.

The drawings are objected to due to an informality. In particular, the Examiner has requested that Figures 1 and 2 be designated as "Prior Art", because only that which is old is illustrated. Enclosed is a marked-up, amended sheet of drawings, showing the "Prior Art"

designation added to Figures 1 and 2 in red ink. If the amended drawings are acceptable to the Examiner, the Examiner is respectfully requested to replace the previously submitted formal drawings with the amended formal drawings submitted in duplicate herewith.

Claim Rejections Under 35 USC § 112

Claims 2, 3, 13, 14, 15, and 26 are rejected under 35 USC § 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. In particular, the Examiner states that the rejected claims recite a surface roughness range, but that the unit of measurement for surface roughness is unclear.

Each of the rejected claims recites a surface roughness range in Ra units, which are commonly used units for expressing average surface roughness. The Examiner is directed to the enclosed attachments, which were downloaded from the Internet, and which describe Ra average surface roughness calculations. There is an ASME standard for Ra average surface roughness (ASME B46.1-2002).

In light of the general recognition and use of the Ra roughness unit for purposes of describing surface characteristics, applicants respectfully request withdrawal of the rejection of Claims 2, 3, 13, 14, 15, and 26 under 35 USC § 112, second paragraph.

Claim Rejections Under 35 USC § 102

Claims 1, 4, 7, 9 - 12, 15, 18, 20 - 22, 24, 27, and 30 are rejected under 35 USC § 102(b) as being anticipated by U.S. Patent No. 6,063,203, to Satoh.

Satoh pertains to a susceptor for plasma CVD equipment, and a process for producing the susceptor. The surface of the susceptor is roughened by a process comprising a step of mechanically flattening the surface of the susceptor; a step of shot-blasting the surface of the flattened susceptor; and a step of polishing the shot-blasted surface of the susceptor chemically, electrochemically, and/or mechanically. A steep protrusion is removed from the surface of the

susceptor, and the resulting susceptor surface has an Ra value between 1 μm and 8 μm. (Abstract) Figure 2B illustrates the surface after shot blasting, and Figure 2C illustrates the surface after subsequent polishing to remove the sharp protrusions at the supper surface of Figure 2B. The surface produced in this manner is considerably different from the surface produced by applicants' method, which is illustrated in applicants' Figure 3. The surface produced by the Satoh method still includes relatively sharp corners which can cause stress point problems with respect to an anodized coating applied over the roughened surface. Applicants' surface is one having the appearance of rolling hills and valleys when magnified, and provides no sharp corners which can act as stress points under a coating applied over the surface. Applicants' independent Claims 1, 12, and 24 have been amended to recite that the electrochemically roughened aluminum surface has the appearance or rolling hills and valleys when magnified. This recitation was taken from original Claims 5, 15, and 27, respectively, and was incorporated into the independent claims.

As previously mentioned, applicants teach away from the use of bead blasting or shot blasting as a means of roughening an aluminum surface for use within a semiconductor processing chamber. Applicants have instead developed a method of electrochemically roughening an aluminum-comprising surface, which method provides a surface which does not entrap particles, is free from jagged and hooked surface formations, and can be coated with an anodized layer or other protective layer without the concern that stress points beneath the surface will cause such protective layer to crack. Prior to the present invention, such protective layers (coatings) cracked in the manner shown in applicants' Figure 1. Applicants have demonstrated that their electrochemically roughened aluminum surface relieves stress in an anodized finish subsequently produced over the roughened surface, so that the anodized layer does not crack upon thermal cycling up to about 300°C. (Page 3, line 23, through page 4, line 1, of applicants' Specification)

The Satoh reference requires additional surface preparation steps which applicants teach are harmful, forms a surface which is different from the surface formed and claimed by applicants, and neither teaches nor suggests applicants' presently claimed invention. In light of the above distinctions, applicants respectfully request withdrawal of the rejection of Claims 1, 4, 7, 9 - 12, 15, 18, 20 - 22, 24, 27, and 30 under 35 USC § 102(b), over Satoh.

Claim Rejections Under 35 USC § 103

Claims 2, 3, 5, 6, 13, 14, 16, 17, 25, 26, 28, and 29 are rejected under 35 USC § 103(a) as being unpatentable over Satoh.

The deficiencies of the disclosure of Satoh with respect to the patentability of the presently claimed invention are discussed in detail above. Applicants maintain that Claims 2, 3, 5, 6, 13, 14, 16, 17, 25, 26, 28, and 29 (all of which depend from Claim 1) are patentable over the disclosure of Satoh for the same reasons that applicants' independent Claim 1 is patentable over Satoh, as discussed in detail above.

In light of the above distinctions, applicants respectfully request withdrawal of the rejection of Claims 2, 3, 5, 6, 13, 14, 16, 17, 25, 26, 28, and 29 under 35 USC § 103(a), over Satoh.

Claims 8, 19, 23, and 31 - 33 are rejected under 35 USC § 103(a) as being unpatentable over Satoh, in view of U.S. Patent No. 6,007,673, to Kugo et al.

The deficiencies of the disclosure of Satoh with respect to the patentability of the presently claimed invention are discussed in detail above.

The Kugo et al. reference discloses roughening the bottom surface of a quartz top plate which is placed on the bottom electrode of a semiconductor processing chamber. Roughening of the bottom surface of the quartz top plate is performed in order to enhance the adhesion between the quartz top plate and deposits resulting from a dry etching process. (Abstract) At Col. 6, lines

65 - 66, Kugo et al. teaches the use of sand blasting or grinding with coarse abrasive grains to effect roughening of the surface to the desired surface roughness. The surface of the quartz top plate 1 is illustrated in Figure 1 and shows sharp points at the upper surface, of the kind observed by applicants when bead blasting is carried out on an aluminum surface. This is precisely this kind of surface applicants seek to avoid. As previously discussed, applicants' method produces a surface exhibiting rounded, rolling hills and valleys upon magnification.

In summary, the Satoh and Kugo et al. references both teach roughening of a surface by shot / sand blasting which produces sharp, pointed protrusions above the lower level locations upon the surface. As set forth above, applicants' claims have been amended to recite that the surface has the appearance of rolling hills and valleys when magnified. Even if one were to combine the disclosure of Kugo et al. with that of Satoh, one skilled in the art would not be led in the direction of applicants' claimed invention.

Whether taken alone or in combination, neither Satoh nor Kugo et al. teaches or even suggests applicants' claimed invention. In light of the above distinctions, applicants respectfully request withdrawal of the rejection of Claims 8, 19, 23, and 31 - 33 under 35 USC § 103(a), over Satoh, in view of Kugo et al.

Applicants believe that the presently pending claims as amended are in condition for allowance, and the Examiner is respectfully requested to enter the present amendment and to pass the application to allowance.

The Examiner is invited to contact applicants' attorney with any questions or suggestions, at the telephone number provided below.

Respectfully Submitted,

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Surface Texture From Ra to Rz

By George Schuetz
Marketing Manager , Tools and Gages, Mahr Federal, Inc.

The irregularity of a machined surface is the result of the machining process, including the choice of tool; feed and speed of the tool; machine geometry; and environmental conditions. This irregularity consists of high and low spots machined into a surface by the tool bit or a grinding wheel. These peaks and valleys can be measured and used to define the condition and sometimes the performance of the surface. There are more than 100 ways to measure a surface and analyze the results, but the most common measurement of the mark made by the tool, or the surface texture, is the roughness measurement.

It is not uncommon for different parties involved in the production to use different methods for roughness measurement. In this column we will talk about only two of the many methods of roughness measurement, how to convert between these two methods, and how to avoid the problems caused by the inevitable use of more than one roughness measurement.

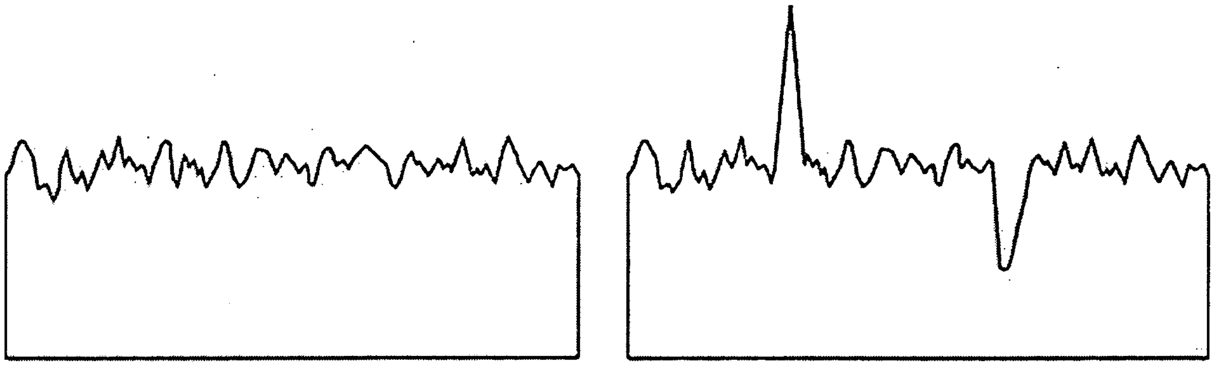
* In North America, the most common parameter for surface texture is Average Roughness (Ra). Ra is calculated by an algorithm that measures the average length between the peaks and valleys and the deviation from the mean line on the entire surface within the sampling length. Ra averages all peaks and valleys of the roughness profile and then neutralizes the few outlying points so that the extreme points have no significant impact on the final results. It's a simple and effective method for monitoring surface texture and ensuring consistency in measurement of multiple surfaces.

In Europe, the more common parameter for roughness is Mean Roughness depth (Rz). Rz is calculated by measuring the vertical distance from the highest peak to the lowest valley within five sampling lengths, then averaging these distances. Rz averages only the five highest peaks and the five deepest valleys—therefore extremes have a much greater influence on the final value. Over the years the method of calculating Rz has changed, but the symbol Rz has not. As a result, there are three different Rz calculations still in use, and it is very important to know which calculation is being defined before making the measurement.

In today's global economy, machined parts are being made and shipped around the world. As a result, manufacturing and quality control engineers are often forced to decide whether or not to accept a part when the print requirements are not consistent with measurement on the surface gages in the local facility. Some quality control engineers might even assume that if a part is checked and passed using the parameter available, the part would also pass other checks. In these cases, the engineers are assuming a constant correlation, or ratio, exists between different parameters.

If there were no choice but to accept some assumptions, there are rules of thumb that can help clear up the confusion and convert Ra to Rz or Rz to Ra. If the manufacturer specifies and accepts the Rz parameter, but the customer uses the Ra parameter, using a ratio range for Rz-to-Ra = 4-to-1 to 7-to-1 is a safe conversion. However, if Ra is used as an acceptance criteria by the manufacturer, but the customer accepts Rz to evaluate the part, then the conversion ratio would be much higher than 7-to-1, possibly as high as 20-to-1. Keep in mind that the actual shape of the part's profile will have a significant impact on these ratios.

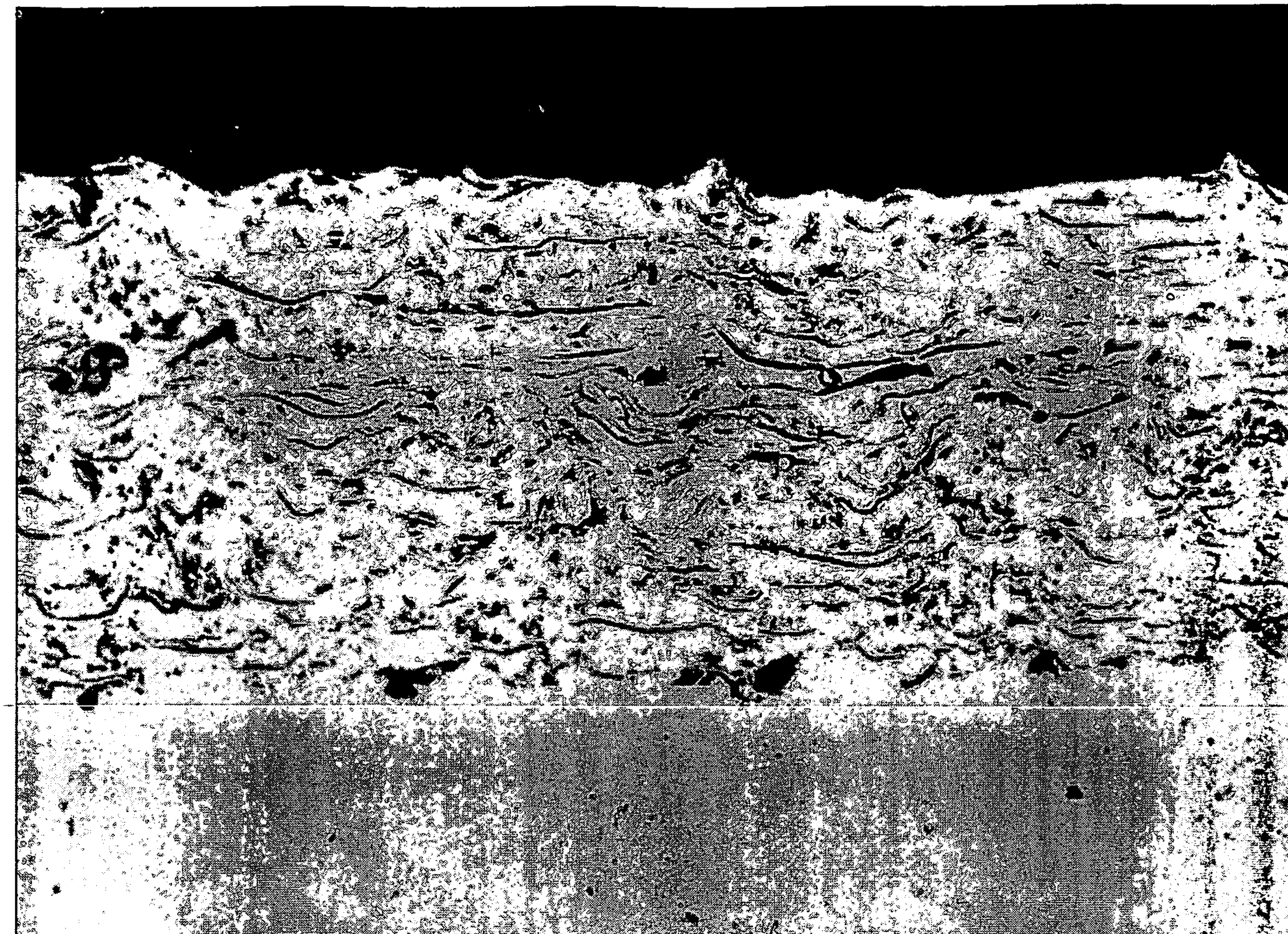
Communication at the outset of the project can avoid most surprises. The approximate, and sometimes questionable, comparisons can be avoided by developing an understanding of exactly what a parameter on a print means, and how the various parties involved in the production plan to check surface texture. The best way for those involved in the production to be in agreement on the parameters for measurement is to have capable evaluation equipment in both the manufacturer's and customer's facility, making the same check using the same method. If the manufacturer or the customer uses conversion ratios, then both parties should be aware of the use of the ratio and be comfortable with the ramifications.



$R_a = R_a$

$R_{max} < R_{max}$

While it is best to measure using the parameter specified in the print, there are rules of thumb available that can help clear up the confusion and convert Ra to Rz or Rz to Ra.



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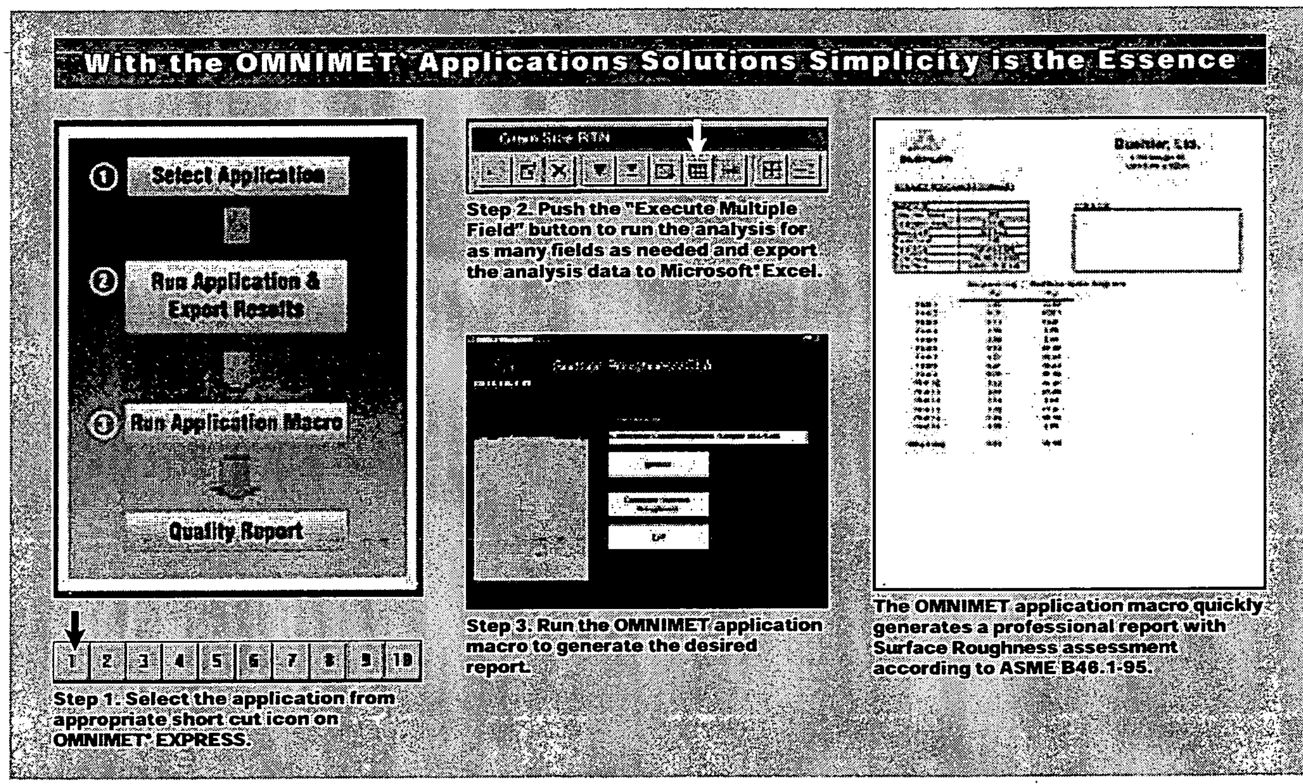
[†]The built in Report Generator is available in version 4.0 and later OMNIMET® EXPRESS and OMNIMET® ENTERPRISE



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